

# RAM Replay Webinar

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Dr. Justin Sanchez  
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5/5/2015



# DARPA BAA PROCESS

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Michael Mutty  
DARPA Contract Management Office

May 5, 2015



- READ THE BAA
  - DRAFTING THE BAA
    - Words are Meaningful
    - Must and Shall
    - May
  - Technical vs Administrative
    - Technical Leads to "Selectable"
    - Administrative Leads to Contract Award
      - Cost Proposal
      - IP Assertions



# BAA PROCESS

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- PROPOSAL PREPARATION/SUBMISSION
  - Instructions are detailed in the BAA (**Follow closely**)
  - **ALL** questions to DARPA-BAA-15-34@darpa.mil
  - FAQ (including today's) will be available on the BTO Solicitations Page ([http://www.darpa.mil/Opportunities/Solicitations/BTO\\_Solicitations.aspx](http://www.darpa.mil/Opportunities/Solicitations/BTO_Solicitations.aspx)) (**Read Regularly**)
  - Funding instruments = procurement contract(s), other transactions, assistance instruments (grants, cooperative agreements)
- Assert rights to **all** technical data & computer software generated, developed, and/or delivered to which the Government will receive less than Unlimited Rights
- If you don't justify your proposed costs, we can't justify awarding you a contract.
  - Pay close attention to cost proposal instructions



# BAA PROCESS

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- EVALUATION/AWARD
  - Read Evaluation Criteria Carefully
  - Government reserves the right to select for award all, some, or none of the proposals received.
  - Government anticipates making multiple awards
  - No common Statement of Work - Proposals evaluated on individual merit and relevance as it relates to the stated research goals/objectives rather than against each other
- Overview of the Process
  - 3 Government Reviewers
  - PM Recommendation to the SRO
  - Notification

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# The Military Brain

Restoring Active Memory  
(RAM)

Under extraordinary stress



Subject to extraordinary injury



Restoring Active Memory:  
Replay

Controlling complex systems  
for complex missions



Learning complex tasks and  
concepts





# Foundations of Memory Research at DARPA

Demonstration in Rodents

Increased Complexity in Primates

Restoration in Injured Humans

Application across Skill Learning

Human Assisted Neural Devices (HAND)



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Restorative Encoding Memory Integrative Neural Device (REMIND)



© Wikipedia

Restoring Active Memory (RAM)



© www.alcen.com

RAM Replay



© US Air Force

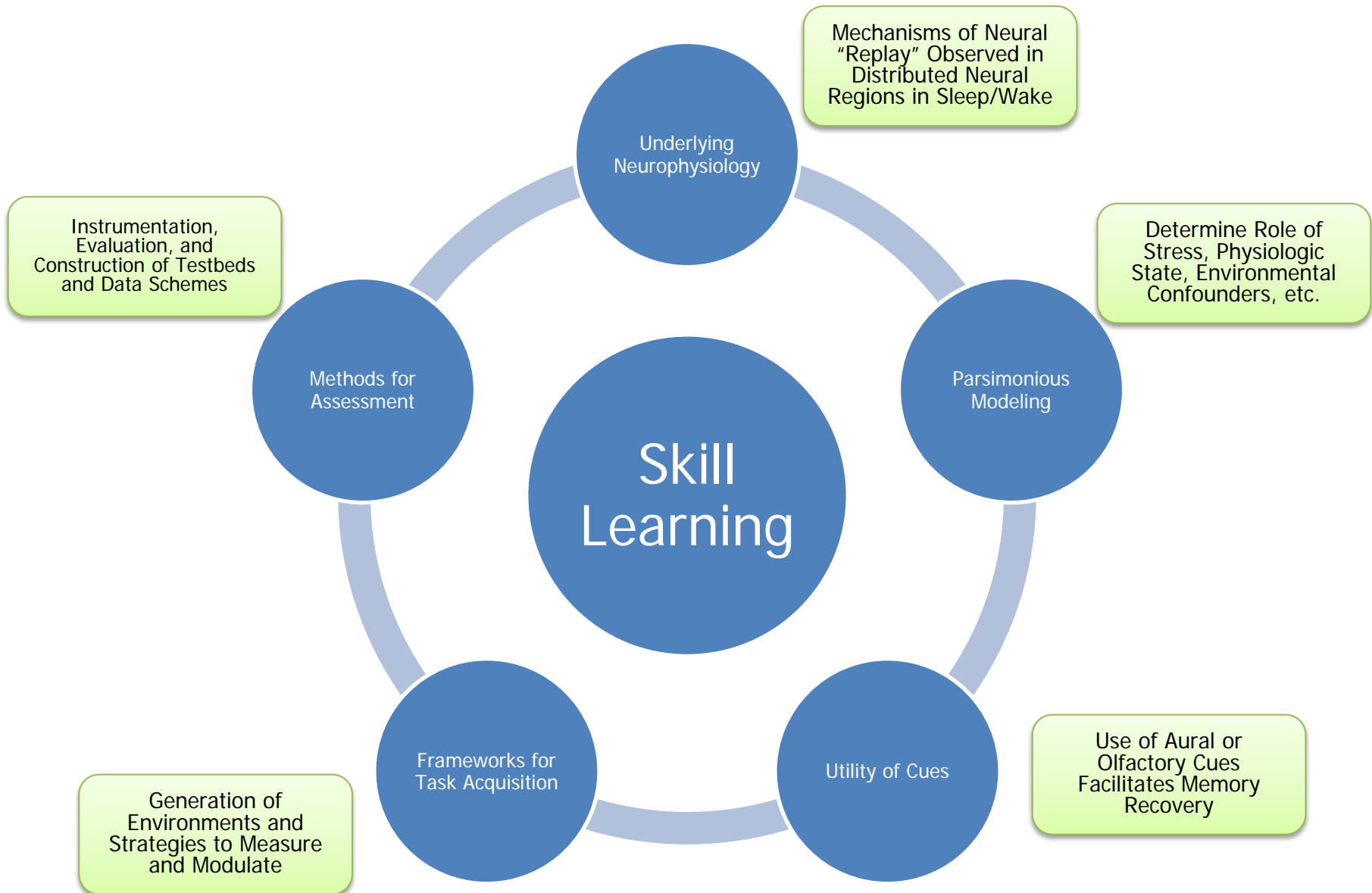


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# Needs Gaps: Current Approaches





# What is RAM Replay?

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## Accelerated Program

- 24 month, single Phase program
- Proposers should provide intermediary deliverable milestones

## General Purpose Program

- Benefit not restricted to medical or rehabilitation settings
- Neuroscience for everyday use

## Specific, Transformative Goals

- Precision identification of both specific mechanisms that lead to improvements and deficits in skilled learning and quantification of the contribution of each mechanism
- Demonstration of environments for measurement, acquisition, and demonstration of skill learning that go beyond computer-based testing and provide real-world relevant testbeds



# RAM: Replay Technical Areas

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## Technical Area One:

Development and Parameterization of Computational Models of Memory Replay



- ☐ Identification of Factors Contributing to Memory
- ☐ Defining, Evaluating, and Demonstrating Direct and Surrogate Measures
- ☐ Constructing Methods to Instantiate Models both Offline and in Real-Time
- ☐ Validating Models with Real-World Data

## Technical Area Two:

Development of an Assay for Assessing, Enabling, and Improving Memory in Humans



- ☐ Ensuring Relevance to Skill Learning and Task Performance through Generating New Paradigms
- ☐ Expanding Novel, Immersive Platforms for Training
- ☐ Demonstrating Utility of Assay as an Intervention to Assess, Enable, and Improve Memory Replay
- ☐ Qualifying and Improving Assay Validity and Stability



# Metrics by Technical Area

Technical Area	Requirement	Metrics
TA1	Environmental	<ul style="list-style-type: none"><li>Identify and quantify confounders, effects, and cues</li><li>Integrate cues into toolboxes</li><li>Produce parameters of an intervention and predict behavioral performance</li></ul>
	Physiological	<ul style="list-style-type: none"><li>Identify non-neural state or signal relevant to memory formation</li><li>Demonstrate ability to relate states and signals to memory consolidation, recall, and replay</li><li>Produce parameters of an intervention and predict behavioral performance</li></ul>
	Neurophysiological	<ul style="list-style-type: none"><li>Identify and quantify states, spatial brain targets, and spatiotemporal patterns related to skill acquisition, memory formation, and replay</li><li>Identify and quantify consistency and generalizability of neural replay features</li><li>Determine influence of sequences on parameters of replay</li><li>Produce parameters of an intervention and predict behavioral performance</li></ul>
	Sleep/Wake State	<ul style="list-style-type: none"><li>Identify optimal sleep states, and brain state parameters for memory replay</li><li>Determine competing brain states to replay during awake behavior</li><li>Produce parameters of an intervention and predict behavioral performance</li></ul>
	Human Performance	<ul style="list-style-type: none"><li>Develop and validate a behavioral paradigm to enable memory acquisition and assessment of memory recall and use</li><li>Demonstrate effect of current and prior experiences on memory</li><li>Differentiate the effects of replay parameters on subsequent task performance</li><li>Predict behavioral performance and recall of an episodic memory and/or utilization of learned information in a complex task</li></ul>
TA2	Paradigm	<ul style="list-style-type: none"><li>Develop a virtual or real situational paradigm enabling human participants to experience DoD-relevant events involving interaction between one or more real or virtual individuals</li><li>Enable the assessment and reporting of operational events by human participants, the acquisition and use of motor skills in field-relevant tasks, and the learning of new knowledge related to operational scenarios, both prior to and following one or more periods of sleep</li><li>Assess contributions of complementary and contradictory information on subsequent memory recall or use of learned information required for task performance</li></ul>
	Intervention	<ul style="list-style-type: none"><li>Develop real-time interventions and an interface system to assess, enable, and improve replay in human participants engaged in the paradigm</li><li>Demonstrate ability of the intervention(s), as delivered through the interface system, to assess, improve, and enable replay through measured physiological and/or neurophysiological effects</li><li>Demonstrate ability of the intervention interface system to improve memory recall or use</li></ul>
	Assessment	<ul style="list-style-type: none"><li>Develop means of measuring physiological and/or neurophysiological indicators of replay at key points across participation in the paradigm</li><li>Demonstrate ability to track fidelity of memory replay parameters as a function of time between an event and follow-up memory assessment(s)</li><li>Compare replay parameters as a function of time between intervention and no-intervention conditions</li><li>Quantifiably assess the influence of replay parameters on subsequent behavioral performance on a DoD-relevant task</li></ul>



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